CONNECTOR ASSEMBLY HAVING A LOW-IMPEDANCE GROUND CONNECTION

FIELD

[0001] The described embodiments relate generally to connector assemblies for electronic devices. More particularly, the present embodiments relate to an accessory that includes two connectors that are positioned at an external surface of an electronic accessory and an assembly that provides a low-impedance to ground between the connectors to improve electromagnetic compatibility (EMC) performance of the accessory.

BACKGROUND

[0002] A wide variety of electronic devices are available for consumers today and are expected to operate in an ever increasingly "noisy" electronic environment. More specifically, with the increasing electromagnetic interference generated by the growing number of electronic devices and wireless features, electronic devices must meet demanding electromagnetic compatibility (EMC) requirements. EMC requirements may include both regulating electromagnetic emissions from the electronic device and electromagnetic susceptibility of the electronic device to emissions from other devices.

[0003] Many of these electronic devices have a plurality of external electronic connectors that facilitate communication with and/or charging of a corresponding device. A reduced ground impedance between the external electronic connectors can improve EMC performance of the electronic device. New electronic connector assemblies that reduce the ground impedance between connectors are needed.

SUMMARY

[0004] In some embodiments a connector assembly comprises a first connector having an exterior metallic shell and a receiving cavity sized to receive a plug portion of a mating connector. A second connector has an exterior metallic body and a bracket electrically and mechanically couples the exterior metallic shell to the exterior metallic body. A ground spring is coupled to the exterior metallic shell and has at least one spring arm with a distal end that is positioned within the receiving cavity. In various embodiments the distal end is positioned to contact the plug portion of the mating connector when the plug portion is received within the receiving cavity.

[0005] In some embodiments a ground path is formed between the second connector and the plug portion of the mating connector via the ground spring and the bracket. In various embodiments the ground spring is welded to the exterior metallic shell and welded to the bracket. In some embodiments the bracket is welded to the exterior metallic body. In various embodiments the ground spring includes a pair of spring arms, each having a distal end that protrudes through a corresponding aperture defined by the first connector. In some embodiments the second connector is a tab connector.

[0006] In some embodiments a connector assembly comprises a receptacle connector having an insulative enclosure and an exterior metallic shell formed at least partially around an exterior of the enclosure, the enclosure defining a receiving cavity sized to receive a plug portion of a mating connector. A bracket is coupled to the exterior metallic shell and a ground spring is positioned between the exterior metallic shell and the bracket, the ground spring having at least one spring arm with a distal end that protrudes through an aperture defined by the enclosure such that the distal end is positioned within the receiving cavity.

[0007] In some embodiments a plug connector having an exterior metallic body that is attached to the bracket. In various embodiments the plug connector includes a pair of transverse extensions that are laser welded to the bracket. In some embodiments the distal end of the at least one spring arm is positioned to contact the plug portion of the mating connector when the plug portion is received within the receiving cavity. In various embodiments a ground path is formed between the plug connector and the plug portion of the mating connector via the ground spring and the bracket.

[0008] In some embodiments the ground spring is welded to the exterior metallic shell and welded to the bracket. In various embodiments the bracket is welded to an exterior metallic body of a plug connector. In some embodiments the ground spring includes a pair of spring arms, each having a distal end that protrudes through a corresponding aperture defined by the enclosure.

[0009] In some embodiments an accessory for an electronic device comprises a housing including a bottom wall extending between first, second, third and fourth sidewalls to define a cavity that is sized and shaped to receive the electronic device. An accessory receptacle connector is disposed within the housing and defines a receiving opening positioned at an outside surface of the housing and a receiving cavity coupled to the receiving opening. A plug connector is positioned within the cavity at an internal surface of the first sidewall and is configured to be inserted into a corresponding receptacle connector of the electronic device when the electronic device is received within the cavity. A bracket is coupled to the accessory receptacle connector and to the plug connector, the bracket having a curved portion that substantially matches a curvature of the first sidewall and a straight portion that extends substantially parallel to the plug connector. A ground spring is positioned between the accessory receptacle connector and the bracket, the ground spring having at least one spring arm with a distal end that is positioned within the receiving cavity.

[0010] In some embodiments the distal end is positioned to contact a plug portion of a mating connector when the plug portion is received within the receiving cavity. In various embodiments a ground path is formed between the plug connector and the plug portion of the mating connector via the ground spring and the bracket. In some embodiments the ground spring is welded to the exterior metallic shell of the accessory receptacle connector and welded to the bracket. In various embodiments the ground spring includes a pair of spring arms, each having a distal end that are positioned within the receiving cavity.

[0011] To better understand the nature and advantages of the present invention, reference should be made to the following description and the accompanying figures. It is to be understood, however, that each of the figures is provided for the purpose of illustration only and is not intended as a definition of the limits of the scope of the present invention. Also, as a general rule, and unless it is evident to the contrary from the description, where elements in different figures use identical reference numbers, the elements are generally either identical or at least similar in function or purpose.